Clarify a Cnidarian Life Cycle – The "Hydrozoan" *Microhydrula limopsicola* Is an Early Life Stage of the Staurozoan *Haliclystus antarcticus*. *PLoS ONE* 5: e10182. doi:10.1371/journal.pone.0010182.
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Release or retain? Prioritising biodiversity conservation when deciding the endpoint for Victorian reptiles and frogs removed from the wild for research purposes

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Abstract
One of several possible endpoints for animals removed from the wild for research purposes is to return those animals (or their progeny) to the wild. However, this endpoint involves risks to wild populations that can be damaging, such as behavioural problems or failure to locate suitable resources, or even catastrophic, such as the introduction or spread of pathogens and disease. Whilst the risk of pathogen transfer can be low for any given release, the consequences when it does occur can be extreme. Risks such as transferring novel or emerging pathogens from captivity to wild populations can occur before pathogens are known to occur. This situation occurred with the introduction to Australia of the amphibian disease chytridiomycosis, which probably entered wild populations via infected captive frogs before the pathogen that causes the disease was identified. I argue that reptiles and frogs removed from the wild in Victoria should not be returned to the wild, and discuss some alternative endpoints for these animals. (*The Victorian Naturalist* **130** (5) 2013, 207–211).

Keywords: research, reptiles, frogs, release, retain

Biodiversity is under increasing pressure around the world (Butchart *et al.* 2010), and reptiles (Gibbons *et al.* 2000; Sinervo *et al.* 2010; Böhm *et al.* 2013) and amphibians (McCallum 2007) are conspicuous components of global biodiversity loss. In fact, loss of amphibians due to the disease chytridiomycosis, caused by the Amphibian Chytrid Fungus *Batrachochytrium dendrobatidis*, over the last few decades has been labelled 'the most spectacular loss of vertebrate biodiversity due to disease in recorded history' (Skerratt *et al.* 2007: 125). Protection and restoration of biodiversity is the primary objective of conservation agencies.

Numerous researchers (> 12 in 2012; author's unpublished data) apply to the Victorian Department of Environment and Primary Industries (DEPI) (formerly Department of Sustainability and Environment) each year for a permit to allow them to collect reptiles and/or frogs within Victoria for research purposes. Typically, these applications fall into one of two categories: those for which returning the animals to the wild is an integral component of the experimental design, and those for which there is no research need to return animals to the wild. It is important to distinguish between returning animals to the wild at the conclusion of a **research** project (the subject of this paper), versus the numerous wildlife **management** projects involving animal releases that occur in Victoria and have Management Authorisations under the *Wildlife Act* 1975. These latter projects must meet strict criteria and have appropriate approvals, and the issues addressed in this paper are typically considered and managed during those projects.

Any movement of animals from captivity to the wild involves risks. These include: introduction or spread of pathogens from captive to wild populations (e.g. Jacobson *et al.* 1991; Picco and Collins 2008; Allender *et al.* 2012), moving animals beyond their existing range (Lever 2001), elevated rates of predation due to unfamiliarity with the field site and retreat locations (Bennett *et al.* 2013), unavailability of biotic and abiotic resources due to competition with conspecifics, and intraspecific aggression or territoriality from wild conspecifics (e.g. Done and Heatwole 1977).

In terms of disease impacts, unknown or novel pathogens may be the most devastating due to host naiveté, because the pathogens may not be evident or understood for some time after release, or because no consideration is given to their management. For example, it is likely that once-captive amphibians contributed to the spread in the wild of the Amphibian Chytrid Fungus and, thus, contributed to losses of frog populations before this pathogen was even known to exist (e.g. Farrer *et al.* 2011). Because of the risk of disease transmission in amphibians during research projects, Phillott *et al.* (2010: 9) recommend 'when assessing permits for such an activity, wildlife conservation agencies and ethics committees should view animals taken from the wild as a permanent take'. Even if the vast majority of cases of returning animals to their point of capture result in no introduction of pathogens, it takes but a single transfer of a devastating pathogen (such as the Amphibian Chytrid Fungus) to cause massive losses of wild populations. And, remaining with the Amphibian Chytrid Fungus example, pathogen screening would not have detected this pathogen at the time that it was initially spreading in Australia because the pathogen was unknown for more than a decade after its introduction. Furthermore, some amphibian species can carry the fungal pathogen without exhibiting the disease chytridiomycosis (Reeder *et al.* 2012); consequently, quarantine would not have necessarily prevented captive to wild transmission of this pathogen.

Retaining collected animals also involves some risks, including the loss to the 'donor' population of the animals collected for the research. This impact is assessed by the DEPI during the permit processing procedure, and, if the collection is supported, will typically be considered negligible, based on best available information at the time. Most research projects involve collection of a relatively modest number of Victorian reptiles and amphibians (pers. obs.); if the impact of collection was deemed not to be negligible, and the population was thought to be unable to cope with such collection, the collection is unlikely to be supported in the first place.

Animal Ethics Committees (AECs) and researchers applying for a permit from the DEPI are often adamant that threatened species removed from the wild for research be released at the conclusion of the project (author's pers. obs.); however, few species are so threatened that minor, judicious collecting will adversely affect a population; if they are that threatened, they should not be collected at all (unless as part of an approved conservation program that necessitates such collection).

Frequently, release of animals is expected (or even demanded) by AECs and applicant researchers with little or no justification for why the animals must be released; when queried on their motivation to return the animals to the wild, the reasoning is usually emotive or based on anthropomorphising of the animal's fate (author's pers. obs. For another example of an AEC applying emotive reasoning, see Jones *et al.* 2012). The need to return reptiles and frogs to the wild must be justified by the researcher or the relevant AEC. This justification should explain how the risks mentioned above have been quantified, and how they will be managed. Furthermore, if release is intended, a funded post-release monitoring program of sufficient duration and intensity to assess the fate of released animals, and other relevant species at the release site, should be implemented. Animal Ethics Committees' unfamiliarity with many species' ecology frequently results in advice that, whilst undoubtedly well-intentioned, could result in undesirable outcomes for the individual animals involved (pers. obs.). If AECs facilitated an open exchange of information between themselves, applicant researchers and experts on the study species, the most ethical endpoint for study animals is more likely.

Wildlife research is a scientific, evidence-based field, and AECs typically demand that applicant researchers provide justification for their work, evidence of why animals must be collected, and citations to justify collection and scientific methods. These committees should be under the same burden of proof when justifying and validating their recommendations, including directives to return animals to the wild. If an AEC cannot demonstrate that the benefits of release outweigh the risks inherent to release, their directives to release lack credibility.

If release is part of the research design

If release of Victorian reptiles and frogs is a component of the experimental design, the following factors must be considered:

- If they are not part of a translocation program approved by the DEPI, are the animals being returned to their precise collection location?
- Have the animals been housed away from other animals? Have the animals been subject to adequate quarantine standards and durations?
- Prior to release, has an adequate sample of animals been subjected to appropriate pathology tests?
- Can the researcher prove that all risks have been adequately managed (disease, predation, intraspecific aggression, territoriality, enough resources)? A number of these factors are typically overlooked or down-played by AECs.
- Does the researcher/AEC have an adequate contingency plan if the monitoring program suggests that the release is problematic for any reason? For example, if disease is introduced or spread, how will this be remedied? If released animals are harassed or killed by conspecifics, how will this be addressed?

Fate of retained animals

There are various potential endpoints for retained animals, including:

- The animals may be suitable for further research projects. This can minimise further collection of wild animals.
- The animals may be kept *in perpetuity* at the research facility (this will necessitate an additional permit).
- The animals may be transferred to a zoological park (this will require a willing zoological park and approval from the DEPI).
- Subject to approvals, and alignment with the captive schedules of the *Wildlife Regulations* 2013, the animals could be transferred to the captive trade.
- Some or all of the animals could be humanely euthanised, preserved, and submitted to Museum Victoria. Comparatively few specimens are contributed to the Museum in the modern era, and submission of these specimens will benefit the collection (e.g. Payne and Sorenson 2002; Feeley and Silman 2011; Joseph 2011; Kemper *et al.* 2011), albeit in a manner geographically biased by the research aims and methods.

Where large numbers of animals are used in a project, a combination of these endpoints could be considered.

Put simply, if biodiversity conservation is an overriding consideration, minimising risks to wild populations must take precedence over the liberty of the small numbers (relative to those remaining in the wild) of individuals used each year for research. This position may be summarised thus:

> If the risk to biodiversity of releasing reptiles and frogs is greater than zero (and it invariably is), and the benefits to biodiversity of such release are zero or unknown (and they usually are), and release is not an integral component of the experimental design, animals should not be returned to the wild (Fig. 1).

In order to put into practice the oft-cited desire to minimise risks to biodiversity, researchers seeking a permit to collect Victorian reptiles and frogs, and the AECs that are charged with overseeing the ethical use of animals in research, must either accept that removal from the wild of animals for research is a permanent take, or that they must bear the burden of proof that releasing these animals will have no conceivable impact on biodiversity.

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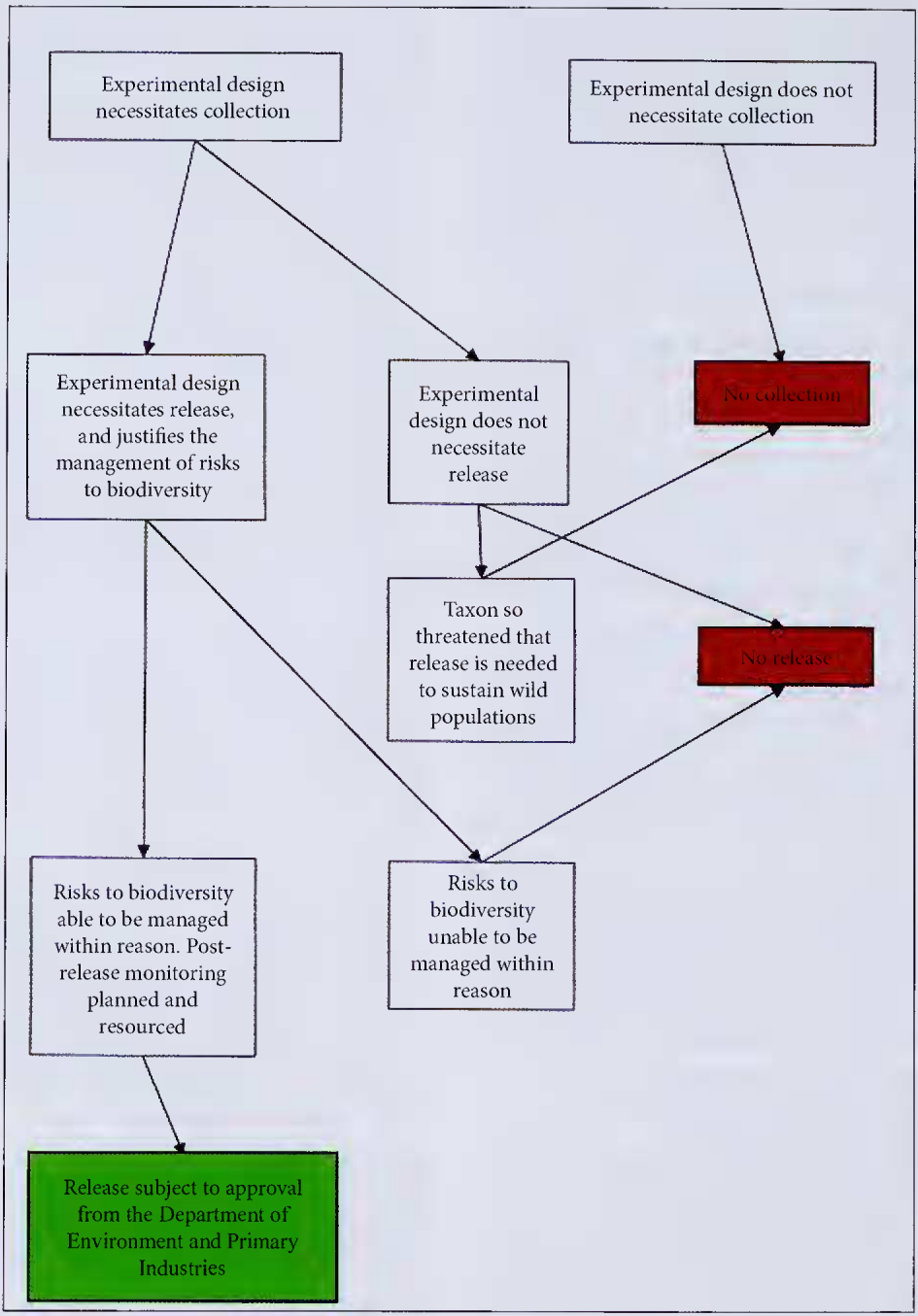

Fig. 1. Deciding on the use and ultimate fate of Victorian reptiles and frogs removed from the wild for research.

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Ninety-Nine Years Ago

SOME COASTAL PLANTS: THEIR SHELTER VALUE AND FIRE DANGER.
BY T.S. HART, M.A., B.Sc.

THE prevalent coastal tea-tree scrub is well known to be highly inflammable; but any extensive removal of vegetation on an open, sandy coast, either to make clear fire-breaks or by general thinning, would be likely to lead to serious and increasing sand-drifting. The practical problem becomes that of preserving a sufficient covering of vegetation of the least inflammable kinds possible. ... I have recently made some rough tests of the ease of ignition of the foliage of several species .... The results may be summarized as follows :—

1. Most inflammable, quick ignition, and plenty of flame—
Leptospermum laevigatum, Coast Tea-tree, and *Leucopogon Richei*, Native Currant.
2. Easily ignited—*Bursaria spinosa*, Sweet Bursaria, *Correa alba*, White Correa, *Casuarina quadrivalvis*, Drooping Sheoke.
3. Fire-resisting plants—*Acacia longifolia*, var. *sophorae*, Coast Wattle, *Rhagodia Billardieri*, Sea Berry, *Tetragonia implexicoma*, Warrigal Cabbage, *Muehlenbeckia adpressa*, Climbing Lignum, *Myoporum insulare*, Boobialla—especially the last three, but the others were not far behind.

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